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मानक

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“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 6873-2-2 (2009): Limits and Methods of Measurements of Radio Disturbance Characteristics, Part 2: Electromagnetic Compatibility (EMC) - Requirements for Household Appliances, Electric Tools and Similar Apparatus, Section 2: Immunity - Product Family Standard [LITD 9: Electromagnetic Compatibility]



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Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS 6873 (Part 2/Sec 2) : 2009
CISPR 14-2 : 1997

भारतीय मानक

रेडियो व्यवधान लक्षणों की मापन पद्धतियाँ एवं सीमाएँ

भाग 2 विद्युत चुम्बकीय संगतता (ई एम सी) — घरेलू साधित्र, विद्युत संयंत्र
और समान उपकरणों के लिये अपेक्षाएँ

अनुभाग 2 प्रतिरक्षा — पारिवारिक उत्पादों के उपयोग हेतु मानक

(दूसरा पुनरीक्षण)

Indian Standard

LIMITS AND METHODS OF MEASUREMENTS OF RADIO DISTURBANCE CHARACTERISTICS

PART 2 ELECTROMAGNETIC COMPATIBILITY (EMC) — REQUIREMENTS FOR
HOUSEHOLD APPLIANCES, ELECTRIC TOOLS AND SIMILAR APPARATUS

Section 2 Immunity — Product Family Standard

(*Second Revision*)

ICS 33.100.20

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NATIONAL FOREWORD

This Indian Standard (Part 2/Sec 2) (Second Revision) which is identical with CISPR 14-2 : 1997 'Limits and methods of measurements of radio disturbance characteristics — Part 2: Electromagnetic compatibility (EMC) — Requirements for household appliances, electric tools and similar apparatus — Section 2: Immunity — Product family standard' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Electromagnetic Compatibility Sectional Committee and approval of the Electronics and Information Technology Division Council.

This standard was originally published in 1977 and revised in 1999 based on CISPR 14 : 1993. This standard has been revised to align with the latest IEC Publication CISPR 14-2 : 1997 consolidated with Amendment No.1 in 2001. This standard deals with the electromagnetic immunity of appliances and similar apparatus for household and similar purposes that use electricity, as well as electric toy and electric tools. The limits for electromagnetic interference were earlier covered in IS 6842 : 1997 'Limits for electromagnetic interference — Specification' which has since been withdrawn.

The text of IEC (CISPR) Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in the Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker in the International Standard while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their respective places are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC 60050-161 : 1990 International Electrotechnical Vocabulary (IEV) — Chapter 161: Electromagnetic compatibility	IS 1885 (Part 85) : 2003 Electro-technical vocabulary: Part 85 Electromagnetic compatibility	Identical
IEC 61000-4-2 : 1995 Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test	IS 14700 (Part 4/Sec 2) : 2007 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques — Section 2: Electrostatic discharge immunity test	do
IEC 61000-4-3 : 1995 Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 3: Radiated, radio-frequency, electromagnetic field immunity test	IS 14700 (Part 4/Sec 3) : 2005 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 3 Radiated, radio-frequency, electromagnetic field immunity test	do
IEC 61000-4-4 : 1995 Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques —	IS 14700 (Part 4/Sec 4) : 2007 Electromagnetic compatibility (EMC): Part 4 Testing and measurement	do

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(Second Revision)

- These requirements represent essential electromagnetic compatibility immunity requirements.

2 Normative references

CISPR 11:1990, *Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment*



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3.5

safety extra-low voltage

a voltage which does not exceed 50 V a.c. or 120 V ripple free d.c. between conductors, or between any conductor and earth, in a circuit which is isolated from the supply mains by such means as a safety isolating transformer

3.6

toy

product designed for, or clearly intended for use in play by children under 14 years old.

Toys may incorporate motors, heating elements, electronic circuits and their combination.

The supply voltage of a toy shall not exceed 24 V a.c. (r.m.s.) or ripple-free d.c. and may be provided by a battery or by means of an adapter or a safety transformer connected to the mains supply.

NOTE Transformers, converters and chargers for toys are considered not to be part of the toy (see IEC 61558-2-7).

3.7

electric toy

toy having at least one function dependent on electricity

3.8

battery toy

toy which contains or uses one or more batteries as the only source of electrical energy

3.9

transformer toy

toy which is connected to the supply mains through a transformer for toys and using the supply mains as the only source of electrical energy

3.10

dual supply toy

toy which can be operated simultaneously or alternatively as a battery toy and a transformer toy

3.11

safety isolating transformer

transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to double insulation or reinforced insulation, and which is designed to supply an appliance or circuit at safety extra-low voltage

3.12

safety transformer for toys

safety isolating transformer specially designed to supply toys operating at safety extra-low voltage not exceeding 24 V

NOTE Either a.c. or d.c. or both may be delivered from the transformer unit.

3.13

constructional kit

collection of electric, electronic or mechanical parts intended to be assembled as various toys

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□ **4.3** Category III: battery powered apparatus (with built-in batteries or external batteries),
□ which in normal use is not connected to the mains, containing an electronic control circuitry
□ with no internal clock frequency or oscillator frequency higher than 15 MHz.
□
□ This category includes apparatus provided with rechargeable batteries which can be charged
□ by connecting the apparatus to the mains power. However, this apparatus shall also be tested
□ as an apparatus in category II while it is connected to the mains network.
□
□ NOTE For toys, examples include musical soft toys, cord-controlled toys and motor-operated electronic toys.
□
□ **4.4** Category IV: all other apparatus covered by the scope of this standard.
□

5 Tests

5.1 Electrostatic discharge

Electrostatic discharge tests are carried out according to basic standard IEC 61000-4-2, with test signals and conditions as given in table 1.

Table 1 – Enclosure port

Environmental phenomenon	Test specification	Test set-up
Electrostatic discharge	8 kV air discharge 4 kV contact discharge	IEC 61000-4-2
NOTE The 4 kV contact discharge shall be applied to conductive accessible parts. Metallic contacts, such as in battery compartments or in socket outlets, are excluded from this requirement.		

Contact discharge is the preferred test method. 20 discharges (10 with positive and 10 with negative polarity) shall be applied on each accessible metal part of the enclosure. In case of a non-conductive enclosure, discharges shall be applied on the horizontal or vertical coupling planes as specified in IEC 61000-4-2. Air discharges shall be used where contact discharges cannot be applied. Tests with other (lower) voltages than those given in table 1 are not required.

5.2 Fast transients

Fast transient tests are carried out according to basic standard IEC 61000-4-4, for 2 minutes with a positive polarity and for 2 minutes with a negative polarity, according to the following tables 2, 3 and 4.

Table 2 – Ports for signal lines and control lines

Environmental phenomenon	Test specifications	Test set-up
Fast transients common mode	0,5 kV (peak) 5/50 ns T_r/T_d 5 kHz repetition frequency	IEC 61000-4-4
NOTE Applicable only to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification		

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Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 1 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6
NOTE 1 Not applicable to battery operated appliances that cannot be connected to the mains while in use.		
NOTE 2 Applicable to battery operated appliances that can be connected to the mains while in use, or to appliances for which the length of d.c. cables may exceed 3 m according to the manufacturer's functional specification.		

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 230 MHz 3 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6
For extra low voltage a.c ports, this testing is only applicable to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.		

Environmental phenomenon	Test specifications	Test set-up
RF current common mode 1 kHz, 80 % AM	0,15 MHz to 80 MHz 1 V (r.m.s.) (unmodulated) 150 Ω source impedance	IEC 61000-4-6
NOTE Applicable only to ports interfacing with cables whose total length may exceed 3 m according to the manufacturer's functional specification.		

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☐ **CISPR 14-2 : 1997**

- ## □ 5.7 Voltage dips and interruptions

Table 13 – Input a.c. power ports

6 Performance criteria

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

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- ## 7.2 Application of tests for the different categories of apparatus

Category I apparatus is deemed to fulfil the relevant immunity requirements without testing.

Category II apparatus shall fulfil the following requirements:

- ### 7.2.3 Category III

Category III apparatus shall fulfil the following requirements:

- #### 7.2.4 Category IV

Category IV apparatus shall fulfil the following requirements:

- electrostatic discharge with performance criterion B (5.1);
- fast transients with performance criterion B (5.2);
- injected currents up to 80 MHz with performance criterion A (5.4);
- radiofrequency EM fields with performance criterion A (5.5);
- surges with performance criterion B (5.6);
- voltage dips and interruptions with performance criterion C (5.7).



8.1 The tests shall be made in the specified frequency band, while the apparatus is operated as intended in the most susceptible operating mode, as described by the manufacturer, consistent with usual operation.

Tests shall be carried out under the conditions specified in CISPR 14 where applicable. The tests shall be carried out within the specified or typical environmental range for the apparatus, and at its rated supply voltage and frequency. If the apparatus can be set at different levels (for example speed, temperature), a setting below maximum shall be used, preferably at approximately 50 % level.

Microwave ovens, cooking ovens, hobs and induction cooking appliances shall be tested, loaded with $1 \text{ l} \pm 0.5 \text{ l}$ tapwater: long lasting tests may be interrupted to refill the load.

During the tests, toys are operated under normal operation. Transformer toys are tested with the transformer supplied with the toy. If the toy is supplied without a transformer, it shall be tested with an appropriate transformer.

In case of associated devices (for example, video toy cartridges) sold separately to be used with different appliances, the associated device shall be tested with at least one appropriate representative hosting appliance, selected by the manufacturer of the associated device, in order to check conformity of the associated device for all appliances with which it is intended to operate. The hosting appliance shall be representative of series produced appliances and shall be typical.

However, the manufacturer's specification of test configuration, conditions and performances takes precedence.

8.2 Where applicable, the configuration of the EUT shall be varied to achieve maximum susceptibility. If the apparatus can be connected to auxiliary apparatus, then the apparatus shall be tested while connected to the minimum configuration of auxiliary apparatus necessary to exercise all existing ports.

8.3 The tests concerning ESD, transients, surges and voltage interruptions are carried out during each mode of operation of the EUT (or phase as part of the mode of operation) selected for the test.

8.4 The tests concerning e.m. fields and current injection are carried out during the scan time while, at random, the selected modes of the EUT are set into operation. In addition, tests are performed at five selected spot frequencies, each for up to 3 min at the selected modes of operation.

8.5 For manual selection of the mode of operation, the test may be interrupted, or care should be taken that the operator does not influence the test results.

8.6 In case of an EUT with an automatic cycling programme, the scan time shall be started at random. Where a single cycle lasts longer than the scan time, the test shall be repeated until the cycle is finished.

8.7 Service programmes shall be tested if they are user accessible.

- **8.8** The configuration and mode of operation during the tests shall be precisely noted in the test report.

- NOTE Care should be taken that changes in the environment, such as power supply, do not influence the test results.

□ **9 Assessment of conformity**

□ **9.1 Single product evaluation**

- Apparatus manufactured in series production shall be verified by performing a type-test on one representative model, or on one series-produced apparatus.

The manufacturer's or supplier's quality system shall ensure that the tested model or apparatus is representative of the series-produced apparatus concerned.

For apparatus not produced in series, the test procedures shall ensure that each individual apparatus meets the requirements when tested by the methods specified.

Results obtained for an apparatus tested when installed in its place of use (and not on a test site) relates to that installation only, and shall not be considered representative for any other installation.

9.2 Statistical evaluation

The significance of the requirements for compliance of the apparatus with the standard shall be that, on a statistical basis, at least 80 % of the series produced apparatus complies with the requirements with at least 80 % confidence.

When type-testing is carried out on a single piece of apparatus, compliance with the requirements on the 80 %/80 % basis is not guaranteed.

Compliance is judged from the condition that the number of apparatus which do not fulfil the requirements may not exceed c in a sample of size n .

n	7	14	20	26	32
c	0	1	2	3	4

If the tests on the sample result in non-compliance with the requirements, then a second sample may be tested, and the results combined with those from the first sample. Compliance is then checked for the combined sample.

NOTE For general information, see Section Nine of CISPR 16, Statistical consideration in the determination of limits of radio interference.

In case of dispute, assessment of conformity with this standard shall be based on the statistical method of evaluation.

The specification prepared by the manufacturer, for the acceptable level of EMC performance, or degradation of EMC performance during or after the testing required by this standard, shall be made available upon request.

Bibliography

- ☐ IEC 61558-2-7, *Safety of power transformers, power supply units and similar – Part 2-7: Particular requirements for transformers for toys*
- ☐
- ☐
- ☐ CISPR 16-2:1996, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2: Methods of measurement of disturbances and immunity*
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<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
Section 4: Electrical fast transient/burst immunity test	techniques, Section 4 Electrical fast transient/burst immunity test	
IEC 14700-4-11 : 1994 Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 11: Voltage dips, short interruptions and voltage variations immunity tests	IS 14700 (Part 4/Sec 11) : 2008 Electromagnetic compatibility (EMC): Part 4 Testing and measurement techniques, Section 11 Voltage dips, short interruptions and voltage variations immunity test	Identical
CISPR 14-1 : 2000 Electromagnetic compatibility — Requirements for household appliances, electric tools and similar apparatus — Part 1: Emission	IS 6873 (Part 2/Sec 1) : 2009 Limits and methods of measurements of radio disturbance characteristics: Part 2 Electromagnetic compatibility (EMC) — Requirements for household appliances, electric tools and similar apparatus, Section 1 Emission (<i>second revision</i>)	do
CISPR 16-1 : 1993 Specification for radio disturbance and immunity measuring apparatus and methods — Part 1: Radio disturbance and immunity measuring apparatus	IS 10052 (Part 1) : 1999 Specification for radio disturbance and immunity measuring apparatus and methods: Part 1 Radio disturbance and immunity measuring apparatus (<i>first revision</i>)	do
CISPR 16-2 : 1996 Specification for radio disturbance and immunity measuring apparatus and methods — Part 2: Methods of measurement of disturbances and immunity	IS 10052 (Part 2) : 1999 Specification for radio disturbance and immunity measuring apparatus and methods: Part 2 Methods of measurement of disturbances and immunity (<i>first revision</i>)	do

The technical committee responsible for the preparation of this standard has reviewed the provisions of the following International Standards and has decided that they are acceptable for use in conjunction with this standard:

<i>International Standard</i>	<i>Title</i>
IEC 61000-4-5 : 1995	Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 5: Surge immunity test
IEC 61000-4-6 : 1996	Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 6: Immunity to conducted disturbances, induced by radio-frequency fields

Only the English language text in the International Standard has been retained while adopting it in this Indian Standard, and as such the page numbers given here are not the same as in the IEC Standard.

For the purpose of deciding whether a particular requirements of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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